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PATENT SPECIFICATION



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437,381

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PROVISIONAL SPECIFICATION

Improvements relating to Suction Appliances for Attachment to Surfaces

I, STEPHEN ARNOLD MARPLES, of "Norton", Walpole Avenue, Chipstead, Coulsdon, in the County of Surrey, of British nationality, do hereby declare the nature of this invention to be as follows:—

This invention relates to suction appliances for attachment to any smooth surface and adapted to carry or display one or more labels, advertisements or articles.

According to my invention, I make a suction device comprising a member, preferably in the form of a disc, cup or annulus, of indiarubber or similar elastic material, having a rim or edge on the side which is presented to the surface adapted to adhere to said surface and provided with one or more plain, perforated, slit or shaped members of flexible metal or other springy material or a combination of springy and rigid material inserted, cemented or held by friction within, or made integral with the elastic member and capable of bending or flexing with the elastic member under pressure so applied as to drive air from a recess formed in either or both members, within said rim on the side presented to the surface and of reacting upon release of such pressure, so that said rim adheres to the surface by suction; the said elastic or the said springy material or both being, if desired, provided with holes, grooves, recesses, extensions or attachments adapted to form or hold a bracket or shelf or carry or represent any desired object.

The inserted flexible member, hereinafter referred to as the spring, may be in one or more parts of varying flexibility or a combination of rigid and flexible members and moulded integrally with the elastic member, hereinafter referred to as the cup, in the process of manufacture of the latter.

The said recess which is preferably formed in the cup and is arranged in the side thereof which is presented to the surface, hereinafter referred to as the front of the cup, may be formed normally in such cup in a suitable mould in the course of manufacture; or the cup may be recessed or dished by the action of the spring itself, as for example by moulding

a disc of indiarubber in an ordinary vulcanising mould in which the spring has been previously inserted and by which said spring is held in a flexed state so that upon opening the mould after vulcanisation the spring returns to normal shape thus flexing the cup and causing it to resume the desired recessed shape. The said recess may also be formed partly in the elastic member or partly in the flexible member.

In practice it is convenient to make the spring of thin steel in disc form of rather less diameter than the cup and to arrange the same in co-planar relation to the front of the cup, or substantially so. In cases in which a weight or stress is applied directly to the cup or to the said extensions or attachments, the cup or the spring or both may be arranged or shaped in such a manner as to counteract flexion due to such weight or stress; the said spring may also be slotted or perforated to give greater flexibility or flanged, ridged grooved or humped in any suitable manner to give greater rigidity.

In a simple application of my invention I provide an indiarubber cup having a shallow, symmetrically curved recess on the front disposed within a narrow encircling rim of conical shape, that is to say with the outer periphery of the rim extending slightly nearer to the surface to which the cup is to be applied than the inner portion. The back of the cup is flat. Moulded within the body of the cup between the highest point of the curve of the recess and the back of the cup is a flat steel spring in disc form of a diameter approximately equal to the diameter of the curved recess in the front of the cup. A metal stem is fixed at right angles to the centre of the spring and carries a screw thread. The spring is moulded into the rubber cup in course of manufacture of the latter with the metal stem protruding at the back of the cup so that the spring and cup form substantially one unit, the former being perforated in places to secure better adhesion of indiarubber to the metal and impart flexibility to the spring. The spring is so designed that when the desired maxi-

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Price 4s 6d

5 mum pressure is applied to the back of the cup it and its reinforcing spring will be flexed inwards by such pressure until the spring assumes an arc approximately
 10 equivalent, in the inverse direction, to the arc of the curved surface, so that such recess is flattened out against the surface thereby excluding substantially all air from the recess by forcing it under the
 15 rim; upon pressure being withdrawn from the back of the cup the spring reacts and immediately sets up a high degree of vacuum in the recess and insures that the rim adheres closely to the surface.

20 In practice the centre part of the cup with its inserted spring does not return to its normal state but remains almost fully flexed so that the benefit of the reaction of the spring is employed to best advantage and the cup adheres firmly without recourse to any external means of withdrawal or retraction additional to that provided by the reactive pull of the flexed
 25 inserted spring aided to some extent by the resilience of the indiarubber. The conical shape of the rim of the cup is also flattened by the pressure and the outer periphery is pressed more firmly on to the surface than the inner part both by the
 30 reaction of the suction-flexed spring and the air pressure from without.

The protruding central threaded stem is held extremely rigidly in position and can be used as an attachment for any desired
 35 purpose or to carry any object, advertisement or the like; or such attachments can be fitted to any other part of the spring or to the cup itself; or the spring or cup may be provided with extensions for any
 40 similar purposes or made to represent any desired object in full scale or in model form, such as a ship in bas relief or lay figure.

45 I may make the said recess in any form other than in circular or saucer shape. The spring may be of any material that

is harder but more resistant to flexion than the indiarubber or similar elastic material, or disposed within an annulus of the latter, the two forming an air-tight
 50 recessed cup. For instance the spring may be of ebonite or indiarubber hardened by any suitable means to form a more resistant core having a softer exterior, or forming the centre of a softer peripheral
 55 annulus or outer edge, provided with an adhering rim.

The said recess in a suction cup of the types described is of small volumetric capacity and consequently, although the device possesses great adhesive qualities, the cup is only slightly flexed; the india-
 60 rubber is not therefore itself internally stressed to any great extent. The cup is furthermore reinforced by the spring so that the life of the indiarubber and the retention of its elastic properties are improved.

In the case of a cup moulded with a spring that is inserted and also flexed in the mould itself, it will be seen that such a cup is held by the spring in a flexed
 70 state but when the cup is flexed towards and, upon the release of such pressure, retained by the suction against a surface, it is then held in its normal moulded
 75 shape or substantially so, so that in such a position there is little or no flexing of the elastic material. It will therefore the better retain its elastic and wearing char-
 80 acteristics under ordinary conditions of use and under abnormal conditions, such as when used in tropical climates, which would cause heavily stressed material rapidly to perish. It will be appreciated
 85 that a flat spring-steel disc enclosed in indiarubber is protected from rust, and the whole forms a cheap and effective suction device.

Dated the 27th day of April, 1934.
 S. A. MARPLES.

COMPLETE SPECIFICATION

Improvements relating to Suction Appliances for Attachment to Surfaces

90 I, STEPHEN ARNOLD MARPLES, of "Norton", Walpole Avenue, Chipstead, Coulsdon, in the County of Surrey, of British nationality, do hereby declare the nature of this invention and in what
 95 manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

100 This invention relates to suction appliances for attachment to any smooth surface and adapted to carry or display one

or more labels, advertisements or articles

According to my invention, I make a suction device comprising a member, preferably in the form of a disc, cup or annulus, of indiarubber or similar elastic
 105 material, having a rim or edge on the side which is presented to the surface adapted to adhere to said surface and provided with one or more plain, perforated, slit or shaped members of flexible metal or
 110 other springy material or a combination

of springy and rigid material inserted, cemented or held by friction within, or made integral with the elastic member and capable of bending or flexing with the
 6 elastic member under pressure so applied as to drive air from a recess formed in either or both members, within said rim on the side presented to the said surface and of reacting upon release of such
 10 pressure, so that said rim adheres to the surface by suction; the said elastic or the said springy material or both being, if desired, provided with holes, grooves, recesses, extensions or attachments
 15 adapted to form or hold a bracket or shelf or carry or represent any desired object.

The inserted flexible member, hereinafter referred to as the spring, may be in one or more parts of varying flexibility or
 20 a combination of rigid and flexible members and moulded integrally with the elastic member, hereinafter referred to as the cup, in the process of manufacture of the latter.

25 The said recess which is preferably formed in the cup and is arranged in the side thereof that is presented to the surface (such side being hereinafter referred to as the front of the cup) may be formed
 30 normally in such cup in a suitable mould in the course of manufacture; or the cup may be recessed or dished by the action of the spring itself, as for example by moulding a disc of indiarubber in an
 35 ordinary vulcanising mould in which the spring has been previously inserted and by which said spring is held in a flexed or cupped state so that such spring is embedded in the disc; upon opening the
 40 mould after vulcanisation the spring returns to normal shape thus flexing the disc and causing it to assume the desired recessed shape when not in use. The said
 45 recess may also be formed partly in the elastic member or partly in or by means of the spring, as described.

While such spring may itself be slightly curved or cupped normally, in practice it is convenient to employ a disc of thin
 50 flat steel of rather less diameter than the cup and to arrange the same in co-planar relation or substantially so to the front of the cup, and thus to the surface to which the cup is to be affixed. In cases
 55 in which a weight or stress is applied directly to the cup or to the said extensions or attachments, the cup or the spring or both may be arranged or shaped or strengthened in such a manner as to
 60 counteract flexion due to such weight or stress; the said spring may also be slotted or perforated to give greater flexibility or flanged, ridged or grooved in any suitable manner to give greater rigidity, or provide means for attaching an object.
 65

In a simple application of my invention shown in section and front elevation respectively in Figs. 1 & 2 of the accompanying drawings I provide an india-
 70 rubber cup *a* having a shallow, symmetrically curved recess *b* on the front disposed within a narrow encircling rim *c* of slightly conical shape, that is to say with the outer periphery of the rim
 75 extending slightly nearer to the surface to which the cup is to be applied than the inner portion. The back of the cup *d* is flat. Moulded within the body of the cup between the highest point of the curve
 80 of the recess *b* and the back of the cup is a flat steel spring *e* made in disc form of a diameter approximately equal to, but preferably greater than, the diameter of the curved recess in front of the cup. A
 85 metal stem *f* is riveted at right angles to the centre of the spring and carries a screw thread. The spring is moulded by vulcanising within the rubber cup in course of manufacture of the latter with
 90 the metal stem protruding at the back of the cup so that the spring, stem and cup form substantially one unit, the former being preferably perforated and slotted in places as shown in Figs. 3 & 4 at *e*¹ and *e*²
 95 or embossed as at *e*³ to secure adhesion of indiarubber to the metal or impart the desired degree of flexibility or strength to the spring. The resistance of the spring to flexion is such that when the desired
 100 maximum pressure is applied to the back of the cup, such cup and its reinforcing spring will be flexed inwards by such pressure until the spring assumes a curvature or when viewed in section an arc, approximately equivalent, in the inverse direc-
 105 tion, to the normal curvature, or arc, (prior to flexing) of the curved recess *b*, so that such recess is flattened out against the surface thereby excluding substantially all air from the recess by forcing it
 110 outwards from under the rim; upon pressure being withdrawn from the back of the cup the spring reacts and the recess tends to reform in the cup, but as air cannot return past the outer periphery of the rim
 115 a high degree of vacuum is immediately set up in the recess so that the cup adheres closely to the surface.

In practice the centre part of the cup with its inserted spring does not return to
 120 its normal state but remains almost fully flexed so that the benefit of the reaction of the spring is employed to best advantage and the cup adheres firmly without recourse to external or additional means
 125 of withdrawal or retraction of the cup such as are usually employed to obtain the desired suction. The conical shape of the rim of the cup is also flattened by the said pressure and the outer periphery is
 130

pressed more firmly on to the surface than the inner part both by the reaction of the suction-flexed spring and the air pressure from without.

- 5 The protruding central threaded stem *f* is held extremely rigidly in position and can be used as an attachment for any desired purpose or to carry any object, advertisement or the like. Such means of
10 attachment may take various alternative forms as shown in the sectional drawings Figs. 1, 5 & 6.

In Fig. 1, besides the stem *f*, an additional stem *h* shown in broken lines may be placed near to the outer edge of the spring. If desired the stem *h* may be the only stem. In Fig. 5 bosses *g* are provided integral with the back of the cup. In Fig. 6 lugs or extensions *i* & *j* of the
20 spring *e*, are shown passing through the body of the cup.

Such extensions may be made in the flexible member in any desired form and may take the form of a flange or flanges
25 formed in or extending from any part of the back of the spring; one form of such flange is shown in section in Fig. 7 in which the flange *k* is provided with an inward curved lip *l* into which any desired
30 object may be clipped. In this form a number of perforations, indicated at *m*, provided in the spring, ensure that the cup *a* is not separated into two parts by the spring and therefore remains substantially integral and air-tight.

Such attachments, extensions or flange may be made in any form in the cup or the spring or represent any desired object in full scale or model form, such as a ship,
40 lay figure, trade mark, or the like.

It is clear also that the cup can effectively be made in other than circular form and the recess and its surrounding rim in oval or any suitable shape; provided
45 always that the spring may be operable as described to impart the desired suction in the recess, it need not be symmetrical with it, and I may make the said spring, or strengthen it in places, so that its greatest
50 reactive force shall not necessarily be at or about its centre or centre of mass.

The spring may be of any material that is harder but more resistant to flexion than the indiarubber or similar elastic
55 material. For instance, the spring may be made of one of the compounds known as synthetic resins or of ebonite or indiarubber hardened by any suitable means to form a resistant core integrally moulded
60 or disposed within a softer exterior portion or forming, as shown in Fig. 8, the centre part or plate *c* which may be perforated at *r* of a softer peripheral annulus or outer edge *a* provided with an adhering
65 rim.

Figs. 9 & 10, also shown in section, illustrate a method of manufacture in which the spring is flexed in the operation of moulding within the elastic member.

A number of pins *o* fixed in one part of a mould suitable for vulcanising an indiarubber elastic member are arranged to press in the direction indicated by the arrow against the outer edges of the spring plate *e*. The latter is normally flat, but upon the closing of the mould after filling the latter with indiarubber emulsion an extension or stop *p* fixed in the other part of the mould presses against the stem *f* and flexes the spring as shown in Fig. 9. When the mould is opened the spring regains its normal flat shape and the recess *b* is formed in the front of the elastic member, as shown in Fig. 10.

Fig. 11 illustrates, in plan, a modified form of flexible member, in which the centre portion is entirely removed and a number of arms *q* extend radially inwards from the outer portion. Such a spring may carry a stem or be provided with extensions or the like in any suitable position for any desired purpose.

Fig. 12 illustrates, in plan, a further modification of the flexible member in which this is made up of several flexible strips *s* attached to a flexible or rigid outer member *t* and is designed to be moulded within the elastic member. The parts *s* are preferably riveted together or otherwise joined at the centre and may be similarly joined to the outer ring *t*; or the ring *t* may be held in position without such attachment to the parts *s* by the substance of the elastic member.

The said recess in a suction cup of the types described is of small volumetric capacity and consequently, although the device possesses great adhesive qualities, the cup is only slightly flexed; the indiarubber is not therefore itself stressed to any great extent. The cup is furthermore reinforced by the spring so that the life of the indiarubber and the retention of its elastic properties are improved.

In the case of the cup moulded with a spring that is inserted and also flexed in the mould itself, it will be seen that such a cup when not in use is held by the spring in a flexed state, but when the cup is pressure-flexed towards and, upon release of such flexing pressure, retained by the suction against the surface, it is then held in its normal moulded shape or substantially so, so that in such a position there is little or no flexing or stressing of the elastic material itself. It will therefore better retain its elastic and wearing characteristics under ordinary conditions of use and under abnormal conditions, such as when used in tropical climates, which

would cause heavily stressed material rapidly to perish. It will be appreciated that a flat spring steel disc enclosed in indiarubber is protected from rust, and the whole forms a cheap and effective suction device.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A suction appliance comprising a flexible member combined or not with a rigid member or members disposed wholly or partly within the material of an elastic member and capable of bending or flexing with the elastic member upon the application of pressure upon one side of the said members so as to drive air from a recess provided with an adhering rim formed on the other side of said members and of reacting upon release of such pressure so that said rim adheres to a smooth surface by suction.

2. A suction appliance as claimed in Claim 1 in which the flexible member assumes under a given pressure a curvature substantially equivalent in an inverse direction to the normal curvature of the recess in the elastic member prior to fixing to a surface.

3. A suction appliance as claimed in Claims 1 and 2 in which the flexible member is perforated, shaped, ribbed or slotted to control the degree of flexibility or strength or obtain better adhesion to the elastic member.

4. Suction appliances as claimed in Claims 1 to 3 in which the elastic member is provided with one or more holders, lugs, extensions or flanges to carry or represent an object.

5. Suction appliances as claimed in Claims 1 to 4 in which the flexible

member is provided with one or more holders, lugs, extensions or flanges to carry or represent an object.

6. Suction appliances as claimed in Claims 1 to 5 in which the flexible member is disposed or formed within the elastic member in a flexed state so as to cause a recess to be formed, upon reaction, in one side of the said elastic member substantially as described and illustrated in Figs. 9 and 10 in the accompanying drawings.

7. Suction appliances in accordance with any of the preceding claims in which the centre portion of the flexible member is dispensed with substantially as described and with reference to Fig. 11 of the accompanying drawings.

8. Suction appliances according to Claims 1, 2, 4, 5, 6 and 7 in which the flexible member is composed of several parts of varying flexibility.

9. Suction appliances made in accordance with any of the preceding claims in which the flexible member is made partly or wholly of material of similar composition or characteristics as the elastic member and so treated or hardened as to offer greater resistance to flexion or provide a more resistant core within a softer peripheral annulus.

10. In suction appliances according to any of the preceding claims the provision of an adhering rim round the said recess of conical shape as described and illustrated in Fig. 1 of the accompanying drawings.

11. The improved suction appliances and parts thereof as heretofore described and illustrated in the accompanying drawings.

Dated the 27th day of April, 1935.

S. A. MARPLES.

[This Drawing is a reproduction of the Original on a reduced scale.]

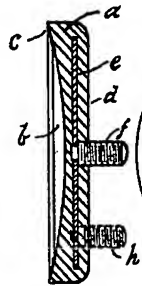


FIG. 1.

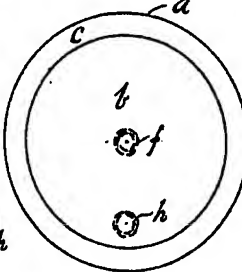


FIG. 2.

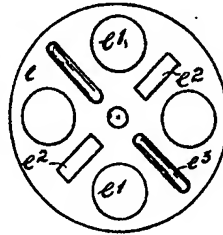


FIG. 3.

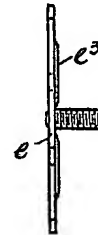


FIG. 4.

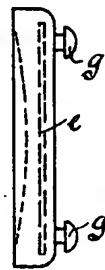


FIG. 5.

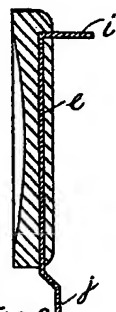


FIG. 6.

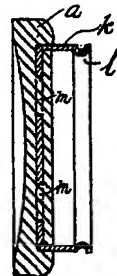


FIG. 7.

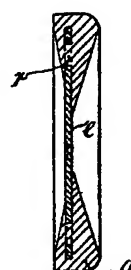


FIG. 8.

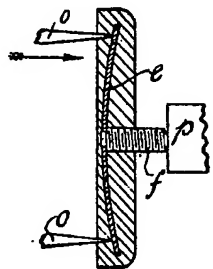


FIG. 9

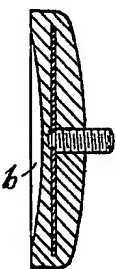


FIG. 10

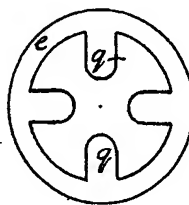


FIG. 11

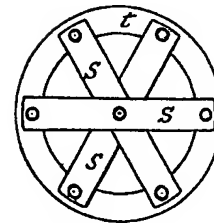


FIG. 12